REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the subject application. The Non-Final Office Action of April 21, 2004 has been received and its contents carefully reviewed.

Claims 2, 3, 5, 6, 14, 15, 17, and 19 have been amended. Claims 1-24 remain in the application.

In the Office Action, the Examiner: objected to the title of the invention; rejected claim 2, 3, 5, 6, 14, 15, 17, and 19 under 35 U.S.C. 112, second paragraph, as being indefinite; rejected claims 1, 2, 4, 5, 7, 9, 11, 13, 14, 16, 17, 20, 21, and 23 under 35 U.S.C. 102(e) as being anticipated by Moon et al. (U.S. Patent No. 6,597,418); and rejected claims 3, 6, 8, 10, 12, 15, 18, 19, 22, and 24 under 35 U.S.C. 103(a) as being unpatentable over Moon.

The title of the present invention has been change, so the Applicant respectfully requests that the Examiner withdraw the objection to the title.

Claims 2, 3, 5, 6, 14, 15, 17, and 19 have been amended to remove the use of "may" and "may be," so the rejection under 35 U.S.C. 112, second paragraph, is now overcome, and the Applicant respectfully requests that this rejection be withdrawn.

Moon is not prior art under 35 U.S.C. 102(e) because the present application claims priority to Korean Patent Application No. 2001-08248 filed on February 19, 2001, which is before Moon's U.S. Filing date of June 13, 2001. Submitted herewith is a certified translation of Korean Patent Application No. 2001-08248 that forms the basis of the claim for priority. Therefore, the rejections over Moon are removed, and Applicant respectfully requests the Examiner to allow claims 1-24.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. § 1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911. A duplicate copy of this sheet is enclosed.

Dated: June 10, 2004

Respectfully submitted,

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VERIFICATION OF TRANSLATION

I, Chan-Joo YOUN of 901 Seoyoung Bldg., 158-12, Samsung-dong, Kangnam-ku, Seoul, 135-090, Korea, declare that I have a thorough knowledge of the Korean and English languages, and the writings contained in the following pages are correct English translation of the specification and claims of Korean Patent Application No. 2001-8248.

This 21st day of July, 2004

By:

[Chan-Joo YOUN]

KOREAN INDUSTRIAL PROPERTY OFFICE

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Industrial Property Office

Application Number : 2001 year Patent Application 8248, PATENT-2001-0008248

Date of Application : February 19, 2001

Applicant(s) : LG. Philips LCD Co., Ltd.

COMMISSIONER

[BIBLIOGRPHICAL DOCUMENTS]

[TITLE OF DOCUMENT] PATENT APPLICATION

[CLSSIFICATION] PATENT

[RECIPIENT] COMMISSIONER

[SUBMISSION DATE] 2001.02.19

[TITLE OF INVENTION IN KOREAN] 반사형 액정 표시 장치

[TITLE OF INVENTION IN ENGLISH] Reflective Liquid Crystal Display Device

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[ALL-INCLUSIVE AUTHORIZATION REGISTRATION NUMBER] 1999-001832-7

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[PURPORT] We submit application as above under the article 42 of the Patent Law, and request the examination of the application under the article 60 of the Patent Law.

Attorney JUNG, WON-KI (seal)

[FEES]

[BASIC APPLICATION FEE]	20 pages	29,000	Won
[ADDITIONAL APPLICATION FEE]	2 pages	2,000	Won
[PRIORITY FEE]	0 things	0	Won
[EXAMINATION REQUEST FEE]	8 clamis	365,000	Won
[TOTAL]		396,000	Won

[ENCLOSED] 1. Abstract, Specifications (with Drawings)_1 set

[DOCUMENT OF ABSTRACT]

[ABSTRACT]

The present invention relates to a reflective liquid crystal display device using a cholesteric liquid crystal color filter.

In general, since a reflective liquid crystal display device uses an exterior light, a reflective liquid crystal display device has advantages in power consumption as compared with a transmissive liquid crystal display device. However, a reflective liquid crystal display device depends on surroundings too much and has low brightness due to low transmittance of color filter.

In the present invention, a cholesteric liquid crystal color filter reflecting light corresponding to a specific wavelength band is formed on a lower substrate and a reflection layer reflecting light corresponding to a whole wavelength band is further formed on the lower substrate, thereby intensity of reflected light increasing. Accordingly, brightness of a liquid crystal display device is improved and contrast ratio increases.

[REPRESENTATIVE FIGURE]

FIG. 3

[KEY WORDS]

reflective type, cholesteric liquid crystal, brightness

[SPECIFICATIONS]

[NAME OF INVENTION]

Reflective Liquid Crystal Display Device

[BRIEF EXPLANATION OF FIGURES]

FIG. 1 is a cross-sectional view of a general reflective liquid crystal display device.

FIG. 2 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to the related art.

FIG. 3 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a first embodiment of the present invention.

FIG. 4 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a second embodiment of the present invention.

FIG. 5 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a third embodiment of the present invention.

* Explanation of major parts in the figures *

210: first substrate	220: absorption layer
230: cholesteric liquid crystal color filter	240: reflection layer
250: first electrode	300: liquid crystal layer

310: second substrate

320: second electrode

330: retardation layer

340: polarizer

[DETAILED DESCRIPTION OF INVENTION]

[OBJECT OF INVENTION]

[TECHNICAL FIELD OF THE INVENTION AND PRIOR ART OF THE FIELD]

The present invention relates to a liquid crystal display (LCD) device, and more particularly, to a reflective cholesteric liquid crystal (CLC) display device using a cholesteric liquid crystal color filter.

Flat panel display devices, which have properties of thin, low weight and low power consumption, have been required as the information age rapidly evolves.

The flat panel display device may be classified into two types depending on whether it emits light or not. One is a light-emitting type display device that emits light to display images and the other is a light-receiving display device that uses an external light source to display images. Plasma display panels (PDPs), filed emission display (FED) devices and electro luminescence (EL) display devices are examples of the light-emitting type display devices and liquid crystal displays are an example of the light-receiving type display device.

The liquid crystal display device is widely used for notebook computers and desktop monitors, etc. because of its superior resolution, color image display and quality of displayed images.

Generally, the liquid crystal display device has upper and lower substrates, which are spaced apart and facing each other. Each of the substrate includes an electrode and the electrodes of each substrate are facing each other. Liquid crystal is interposed between the

upper substrate and the lower substrate. Voltage is applied to the liquid crystal through the electrodes of each substrate, and thus an alignment of the liquid crystal molecules is changed according the applied voltage to display images.

Since the liquid crystal display device cannot emit light as described before, an additional light source is required to display images.

Accordingly, the liquid crystal display device has a backlight behind a liquid crystal panel for a light source. An amount of light incident from the backlight is controlled according the alignment of the liquid crystal molecules to display images. The electrodes of each substrate are formed of transparent conductive material and the substrates must be transparent.

The liquid crystal display devices like this are called transmissive liquid crystal display devices. Since the transmissive liquid crystal display device uses an artificial light source such as the backlight, it can display a bright image in dark surroundings. However, the transmissive liquid crystal display device has high power consumption.

The reflective liquid crystal display device has been suggested to overcome the power consumption problem of the transmissive liquid crystal display device. Since the reflective liquid crystal display device controls a transmittance according the alignment of liquid crystal molecules by irradiating light using an external light source such as ambient light or artificial light, it has a low power consumption compared with the transmissive liquid crystal display device. An electrode of the lower substrate is formed of conductive material having a high reflectance and an electrode of the upper substrate is formed of transparent conductive material to transmit the incident light.

The general reflective liquid crystal display device will be described hereinafter more in detail with reference to attached drawings.

FIG. 1 is a cross-sectional view of a conventional reflective liquid crystal display device. In FIG. 1, a plurality of switching elements (not shown) are formed in an array matrix on a first substrate 10 and a plurality of reflective electrode 12, which are connected to each of the switching elements, is formed on the first substrate 10. The reflective electrode 12, which is formed of conductive material such as metal, serves to reflect the incident light and serves as a pixel electrode.

A color filter 22, which includes sub-color-filters red (R), green (G), and blue (B) in a repeated order, is formed beneath a second substrate 20 and corresponds to the reflective electrode 12. A common electrode 24 is formed of transparent conductive material beneath the color filter 22.

Liquid crystal 30 is interposed between the reflective electrode 12 and the common electrode 24. An alignment of liquid crystal molecules is changed if a voltage is applied to the reflective electrode 12 and the common electrode 24.

A retardation layer 40 is formed on the second substrate 20. The retardation layer 40 has a phase difference of $\lambda/4$ and thus is referred to as a quarter wave plate. The quarter wave plate 40 changes a linear polarization of light into a circular polarization of light and the circular polarization into the linear polarization.

A polarizer 50, which changes ambient light into linearly polarized light by transmitting only the light that is parallel to a light transmission axis, is formed on the quarter wave plate 40.

If the ambient light is irradiated to the reflective liquid crystal display device when the voltage is not applied, the incident light is changed into linearly polarized light as it passes through the polarizer 50, and the linearly polarized light is changed into circularly polarized light as it passes through the quarter wave plate 40.

The circularly polarized light then passes through the second substrate 20, the color filter 22 and the common electrode 24 in sequence, and there is no phase change during this process. The circularly polarized light then passes through the liquid crystal layer 30 and is changed into linearly polarized light as it passes through the liquid crystal layer 30 if the liquid crystal layer 30 is formed to have a phase difference of $\lambda/4$. The linearly polarized light is reflected at the reflective electrode 12 and then is changed into circularly polarized light as it passes again through the liquid crystal layer 30. The circularly polarized light is changed into the linearly polarized light as it passes again through the quarter wave plate 40, and then the linearly polarized light passes through the polarizer 50. At this time, if a polarized direction of the linearly polarized light is parallel to the light transmission axis of the polarizer 50, all of the linearly polarized light transmits through the polarizer 50 and if the polarized direction of the linearly polarized light is perpendicular to the light transmission axis of the polarizer 50, the linearly polarized light cannot transmit through the polarizer 50.

Since the reflective liquid crystal display device uses the external light for its light source as described before, it has a low power consumption.

However, since the reflective liquid crystal display device uses the external light as a light source, a luminance is changeable depending on external circumstances and it has a lower luminance than a transmissive liquid crystal display device under normal office environment. In addition, since the liquid crystal display device uses an absorption type color filter and thus there occurred a high rate of loss of the incident light as the incident light passes through the color filter, the general reflective liquid crystal display device has a rather low brightness. The absorption type color filter and the polarizer usually absorb over 80% of the incident light.

Although the luminance can be increased by reducing a purity of the color filter, there exists a limitation in increasing the luminance only by reducing the purity of the color filter.

Therefore, cholesteric liquid crystal (CLC) display devices, which use CLC color filter to display color images as shown in a Korean Patent Application No. 1999-11108, have been widely researched and developed in the field to resolve this luminance problem of the general reflective liquid crystal display device.

The reflective cholesteric liquid crystal display device, which has a CLC color filter, has a superior color display ability and contrast ratio compared with the general reflective liquid crystal display device that has an absorption type color filter. The cholesteric liquid crystal color filter uses a selective reflection property of the cholesteric liquid crystal. The cholesteric liquid crystal does not reflect all incident light, but selectively reflects the incident light of a specific wavelength according to a helical pitch of the cholesteric liquid crystal. Accordingly, the reflected light may display red, green or blue color by controlling the helical pitch according to each region of the CLC color filter. In addition, the cholesteric liquid crystal color filter also determines a polarization state of the reflected light. For example, the left-handed cholesteric liquid crystal reflects a left circular polarization that has a wavelength corresponding to the pitch of the left-handed cholesteric liquid crystal. That is, a direction of a circular polarization of the reflected light depends on whether the helix structure of the cholesteric liquid crystal is right-handed or left-handed. This is a great difference from a typical dichroic mirror that simply reflects light of particular wavelength and transmits the rest of the light.

FIG. 2 is a cross-sectional view of a reflective cholesteric liquid crystal display device that has a CLC color filter according to the related art. Because the cholesteric liquid crystal color filter serves as a reflector as well as a color filter, an additional reflector is not needed.

As shown in the figure, an absorption layer 120 is formed on a lower substrate 110 and a cholesteric liquid crystal (CLC) color filter 130 is formed on the absorption layer 120. The cholesteric liquid crystal (CLC) color filter 130 displays a red, green and blue color in sequence by reflecting the light of wavelength corresponding to the red, green and blue color. A first electrode 140 is formed on the cholesteric liquid crystal (CLC) color filter 130.

An upper substrate 150 is disposed over the lower substrate 110 and spaced apart from the lower substrate 110. A second electrode 160 is formed beneath the upper substrate 150. A retardation layer 170 having a phase difference value of $\lambda/4$ is formed on the upper substrate 150 and a polarizer 180 is formed on the retardation layer 170.

A liquid crystal layer 190 is interposed between the first electrode 140 and the second electrode 160, and an alignment of the liquid crystal is changed according to the electric field between the first electrode 140 and the second electrode 160.

However, the reflective cholesteric liquid crystal display device using the cholesteric liquid crystal (CLC) color filter still has rather the lower luminance problem.

Since a width of reflection wavelength of the cholesteric liquid crystal (CLC) color filter is a function ($\Delta\lambda=\Delta n\cdot P$) of a refractive index anisotropy value ($\Delta n=n_e-n_o$) and the helical pitch of the cholesteric liquid crystal (CLC), the wavelength band of the reflected light for displaying the red, green and blue color when the cholesteric liquid crystal (CLC) is completely aligned depends only on a characteristics of the cholesteric liquid crystal (CLC) material and a maximum degree of reflection is maintained over a certain thickness of the cholesteric liquid crystal (CLC) color filter. Accordingly, whereas the luminance of the reflected light can be increased by reducing a color purity by controlling an absorption degree and a thickness of the color filter in the convention reflective liquid crystal display device, the luminance of the reflected light may not be easily increased by reducing the color purity by

controlling the thickness of the cholesteric liquid crystal (CLC) color filter in the cholesteric liquid crystal (CLC) display device.

There are a few methods for increasing the luminance of the reflected light when a single layered cholesteric liquid crystal (CLC) color filter is used. For example, if the liquid crystal is aligned incompletely, a wavelength range of the reflected light is enlarged and which reduces the color purity. As the color purity is reduced, the luminance of the reflected is increased. For another example, the luminance of the reflected light can be increased by enlarging the width of the reflection wavelength by mixing the cholesteric liquid crystal (CLC) color filter materials that have different characteristics and controlling a diffusion and a response speed of the materials. However, each of those two methods has disadvantages to be adopted for increasing the luminance of the reflected light. That is, since the former causes a reduction of the reflection degree in a main wavelength range, a luminance increase effect is not adequate. In case of the latter, it is difficult to display the red, green and blue color clearly because of the response mechanism of the cholesteric liquid crystal (CLC) color filter.

[TECHNICAL SUBJECT OF INVENTION]

To overcome the problems described above, an object of the present invention is to provide a reflective liquid crystal display device having an improved brightness, and a method of fabricating the same.

Another object of the present invention is to provide a reflective liquid crystal display device having an improved contrast ratio, and a method of fabricating the same.

[CONSTRUCTION AND OPERATION OF INVENTION]

To achieve these and other objects and in accordance with the purpose of the present invention, as embodied and broadly described, in a reflective liquid crystal display device according to the present invention, an absorption layer is formed on the first substrate and a cholesteric liquid crystal color filter is formed on the absorption layer. A reflection layer reflecting light corresponding to a whole wavelength band and a first electrode are sequentially formed on the absorption layer. A second substrate is spaced apart from and over the first substrate, and a second electrode is formed beneath the second substrate. A retardation layer and a linear polarizer are sequentially formed on the second substrate. A liquid crystal layer is interposed between the first electrode and the second electrode.

The reflection layer laterally contacts the cholesteric liquid crystal color filter or the reflection layer is formed on a whole area of the first substrate having the cholesteric liquid crystal color filter thereon.

The reflection layer is formed of cholesteric liquid crystal polarizer.

The cholesteric liquid crystal color filter has at least two layers that display a same color corresponding to each pixel region but reflect light in a different wavelength band.

In a method of fabricating a reflective liquid crystal display device according to the present invention, a first substrate is provided and an absorption layer is formed on the first substrate. Next, a cholesteric liquid crystal color filter is formed on the absorption layer and a reflection layer reflecting light corresponding to a whole wavelength band is formed on the absorption layer. Next, a first electrode is formed on the cholesteric liquid crystal color filter and the reflection layer. Next, a second substrate is provided and a second electrode is formed on the second substrate. Next, the first substrate and the second substrate are disposed such that the first electrode faces the second electrode. Next, liquid crystal is injected between the

first electrode and the second electrode, and a retardation layer and a linear polarizer are formed on the second substrate.

The reflection layer laterally contacts the cholesteric liquid crystal color filter or the reflection layer is formed on a whole area of the first substrate having the cholesteric liquid crystal color filter thereon.

In the present invention, brightness of a reflective liquid crystal display device using a cholesteric liquid crystal color filter is improved by increasing intensity of reflected light due to an absorption layer reflecting light corresponding to a whole wavelength band.

Hereinafter, reference will now be made in detail to the preferred embodiment of the present invention, example of which is illustrated in the accompanying drawings.

FIG. 3 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a first embodiment of the present invention. As shown in the figure, a first substrate 210 and a second substrate 310 is spaced apart from each other and facing each other. The second substrate 310 is formed of transparent insulating material and the first substrate 210 may be formed of transparent insulating material or material of low transparency.

An absorption layer 220 is formed on the first substrate 210 to absorb light. A cholesteric liquid crystal (CLC) color filter230, which reflects light of particular wavelength, and a reflection layer 240, which reflects lights in a whole range of wavelength, are formed in pixel regions on the absorption layer 220. The cholesteric liquid crystal (CLC) color filter 230 selectively reflects an incident light and the reflected light displays a red, green and blue color in each pixel region. The reflected light at the cholesteric liquid crystal (CLC) color filter 230 does not exactly have a single wavelength but has a certain wavelength range on the basis of a main wavelength. In FIG. 3, the reflection layer 240 is positioned in a middle of the

cholesteric liquid crystal (CLC) color filter 230 corresponding to each pixel region but the reflection layer 240 may alternatively be formed at an edge of the cholesteric liquid crystal (CLC) color corresponding to each pixel region.

A first electrode 250 is formed on the cholesteric liquid crystal (CLC) color filter 230 and on the reflection layer 240 using transparent conductive material.

A second electrode 320 is formed beneath the second substrate 310 using transparent conductive material. A retardation layer 330 is formed on the second substrate 310 and a polarizer 340 is formed on the retardation layer 330. The retardation layer 330 changes a polarization state and because the retardation layer 330 has a phase difference of $\lambda/4$, the retardation layer 330 changes a linearly polarized light into a circularly polarized light and the circularly polarized light into the linearly polarized light. The polarizer 340 transmits only the light that is parallel to a light transmission axis. A diffusing plate (not shown) may further be formed between the second substrate 310 and the retardation layer 330.

Generally, a thin film transistor (not shown), i.e., a switching element, and a pixel electrode that is connected to the thin film transistor are usually formed on the second substrate 310 in the cholesteric liquid crystal (CLC) display device that has the cholesteric liquid crystal (CLC) color filter. Accordingly, the second electrode 320 is formed corresponding to each portion of the cholesteric liquid crystal (CLC) color filter 230 and each portion of the second electrode 320, which corresponds to each portion of the cholesteric liquid crystal (CLC) color filter, is connected to the thin film transistor (not shown) as shown in the figure.

On the other hand, the first electrode 250 may alternatively formed corresponding to each portion of the cholesteric liquid crystal (CLC) color filter 230 and serve as the pixel electrode. Accordingly, each portion of the first electrode 250, which corresponds to each

portion of the cholesteric liquid crystal (CLC) color filter, may be connected to the thin film transistor (not shown) that is formed on the first electrode 250.

A liquid crystal layer 300 is interposed between the first electrode 250 and the second electrode 320. An alignment of liquid crystal molecules is changed according to an electric field between the first electrode 250 and the second electrode 320.

The cholesteric liquid crystal (CLC) color filter 230 selectively reflects the incident light. That is, if a molecular structure of the cholesteric liquid crystal (CLC) is twisted in a clockwise direction, the cholesteric liquid crystal (CLC) reflects only a right-handed circular polarization. This selective reflection is determined by the helical pitch of the cholesteric liquid crystal (CLC) and a different color can be displayed in each pixel by controlling the helical pitch in each pixel. Accordingly, the reflected light can display the red, green and blue color.

Since the cholesteric liquid crystal (CLC) color filter reflects only the light of particular wavelength band, the liquid crystal display device, which uses the cholesteric liquid crystal (CLC) color filter, has a low luminance. Therefore, an amount of the reflected light can be increased by forming the pixel region with the cholesteric liquid crystal (CLC) color filter and the reflection layer that reflects the lights in the whole wavelength band in the present invention. The reflection layer may transmit some of incident light and reflect others of incident light.

As it has been described above, the luminance of the liquid crystal display device can be increased by implementing a combination of the cholesteric liquid crystal (CLC) color filter 230, which reflects only the light of particular wavelength, and the reflection layer 240, which reflects the lights in the whole range of wavelength. Since the amount of the reflected

light is increased with the help of the reflection layer, the luminance of the liquid crystal display device according to the present invention can be improved.

A contrast ratio of the liquid crystal display device usually means a degree of cleanness of displayed image. The contrast ratio is defined as a ratio of a white state luminance to a black state luminance measured in a right front direction of the liquid crystal display device. The displayed image becomes clearer as a difference in luminance becomes bigger. Accordingly, since the luminance of the present invention is increased with the reflection layer 240, the contrast ratio of the liquid crystal display device is improved.

In addition, an area ratio between the cholesteric liquid crystal (CLC) color filter 230 and the reflection layer 240 should be determined on the basis of the required color purity and the luminance.

FIG. 4 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a second embodiment of the present invention. As shown in the figure, the second embodiments of the present invention has a double-layered cholesteric liquid crystal (CLC) color filter 231 and 232 on the absorption layer 220. The reflection layer 240 is positioned in the middle of the double-layered cholesteric liquid crystal (CLC) color filter 231 and 232. Each layer of the cholesteric liquid crystal (CLC) color filter displays same color in the corresponding pixel. However, the wavelength band of the reflected light for displaying the same color is different between the two layers 231, 232. Accordingly, the wavelength band of the reflected light for displaying each color is enlarged as compared with a singled layered cholesteric liquid crystal (CLC) color filter and the reflection layer 240 reflects the lights in the whole wavelength band as before in the first embodiment of the present invention. That is, the reflection layer 240 reflects white light. Accordingly, since the

amount of the reflected light is increased as compared with the first embodiment of the present invention, the luminance of the liquid crystal display device can be further improved.

The reflection layer 240 of the first and the second embodiments may be formed of a cholesteric liquid crystal (CLC) polarizer that reflects lights in the whole wavelength band of a visible light.

FIG. 5 is a cross-sectional view of a reflective cholesteric liquid crystal (CLC) display device having a CLC color filter according to a third embodiment of the present invention. As shown in the figure, the reflection layer 240 is formed thin on a whole area of the cholesteric liquid crystal (CLC) color filter 230. It is desirable to form the reflection layer 240 in a way that the reflection layer 240 reflects the lights in the whole wavelength band but reflects only a part of the incident light by forming a thickness of the reflection layer 240 thin. Accordingly, a part of the incident light transmits the reflection layer 240 and only a part of the incident light, which has a particular wavelength, is reflected at the cholesteric liquid crystal (CLC) color filter 230. Since the reflection layer 240 reflects the white light, which results in an increase of the amount of the reflected light, the luminance of the cholesteric liquid crystal (CLC) display device can be improved.

The reflection layer 240 may be formed of the cholesteric liquid crystal (CLC) polarizer as in the previous embodiments.

It will be apparent to those skilled in the art that various modifications and variation can be made in the fabrication and application of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[EFFECT OF INVENTION]

In a reflective liquid crystal display device according to the present invention, a cholesteric liquid crystal color filter reflecting only light corresponding to a specific wavelength band is used and a reflection layer reflecting light corresponding to a whole wavelength band is further used. Accordingly, brightness of a liquid crystal layer is improved and contrast ratio increases.

[RANGE OF CLAIMS]

[CLAIM 1]

A reflective liquid crystal display device, comprising:

a first substrate;

an absorption layer on the first substrate;

a cholesteric liquid crystal color filter on the absorption layer;

a reflection layer on the absorption layer, the reflection layer reflects light corresponding to a whole wavelength band;

a first electrode on the cholesteric liquid crystal color filter;

a second substrate being spaced apart from and over the first substrate;

a second electrode beneath the second substrate;

a retardation layer on the second substrate;

a linear polarizer on the retardation layer; and

a liquid crystal layer between the first electrode and the second electrode.

[CLAIM 2]

The device according to claim 1, wherein the reflection layer laterally contacts the cholesteric liquid crystal color filter.

[CLAIM 3]

The device according to claim 1, wherein the reflection layer is formed on a whole area of the first substrate having the cholesteric liquid crystal color filter thereon.

[CLAIM 4]

The device according to one of claims 2 and 3, wherein the reflection layer is formed of cholesteric liquid crystal polarizer.

[CLAIM 5]

The device according to claim 1, wherein the cholesteric liquid crystal color filter has at least two layers that display a same color corresponding to each pixel region but reflect light in a different wavelength band.

[CLAIM 6]

A method of fabricating a reflective liquid crystal display device, comprising:

providing a first substrate;

forming an absorption layer on the first substrate;

forming a cholesteric liquid crystal color filter on the absorption layer;

forming a reflection layer on the absorption layer, the reflection layer reflects light corresponding to a whole wavelength band;

forming a first electrode on the cholesteric liquid crystal color filter and the reflection layer;

providing a second substrate;

forming a second electrode on the second substrate;

disposing the first substrate and the second substrate such that the first electrode faces the second electrode;

injecting liquid crystal between the first electrode and the second electrode; and

forming a retardation layer and a linear polarizer on the second substrate.

[CLAIM 7]

The method according to claim 6, wherein the reflection layer laterally contacts the cholesteric liquid crystal color filter.

[CLAIM 8]

The method according to claim 6, wherein the reflection layer is formed on a whole area of the first substrate having the cholesteric liquid crystal color filter thereon.